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Economic Impacts of Professional Training in the Informal Sector:

The Case of the Labor Force Training Program in Côte d'Ivoire

By

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Abstract:

This paper addresses the economic impact of the labor force training program (PAFPA) developed for the informal sector in Côte d'Ivoire. The data contain a subsample of the participants in the agricultural sector, tailoring sector, and the electronics sector and a comparable control group of nonparticipants. The data have been analyzed by use of standard program evaluation tools, namely *difference-in-difference* estimators, in order to detect potential program impacts. We find positive economic impacts as a result of training received for some groups, namely women, the agricultural and electronics sectors, firms employing 1-3 individuals and firms with 10 or more employees.

JEL classification: J24, J31

1. Introduction

The aim of this study is to evaluate the impacts of the training component of the Labor Force Training Support project in Côte d’Ivoire (henceforth PAFPA—Project d’Appui a la Formation de la Population). The program was initiated in 1994 and undertaken in the informal sector. On the basis of a subsample of the participants and a comparable control group, the economic effects of the training program are analyzed by the use of econometric methods appropriate in the actual setup and by data at hand.

PAFPA was initiated in an environment that resulted from over a decade of economic crisis that led to a fall of GDP by 1 percent per year during 1990-93, increasing unemployment, and deepening poverty. During that period, modern sector employment decreased by 1.25 percent per year, while informal sector employment increased by 9 percent per year. In response to the crisis, and following the devaluation of the CFA franc, the government, in an adjusted Policy Framework Paper, reformulated its development strategy. The expectation was that implementation of the policy would strengthen competitiveness of the country's economy and lead to sustainable growth that would improve welfare. In particular, it was expected that new opportunities would be opened in the economy for small and medium-size enterprises, micro-enterprise and informal sector activities involved in the production of import-substitutable goods and sub-contracting. Within this context, PAFPA sought to contribute to the long-term effort of the economic recovery, by improving productivity and employability of a growing and diverse labor force, in an environment in which excess demand for quality labor had been on the rise.

PAFPA targeted the informal sector, which employs over 90 percent of the labor force. The development objectives of PAFPA were to contribute to an increase of labor force productivity and mobility through technical and basic skills training with special emphasis on small informal sector businesses and women's enterprises. Furthermore, the project should improve the government's capacity to monitor and analyze labor market conditions for the formulation of a relevant labor force development strategy. The training was demand-driven and was expected to contribute to an improvement of trainees' capacity to find better employment opportunities in both the formal and informal sectors; to receive higher wages and salaries; and to increase income generated from self-run small businesses. Outreach advisors were introduced to assist training sponsors to effectively mobilize training beneficiaries. This was done to minimize the risk of the demand for and the quality of the training provided not being sufficient for a significant impact on the productivity of the labor force.

The cost of the training component of PAFPA (the component evaluated in this paper) is estimated at roughly US$15 million and it was intended to support: (1) micro-enterprise training and to give priority to master craftsmen who in turn, would improve apprenticeship and product development in the informal sector; (2) training of displaced workers, especially those retrenched from private and public enterprises, with a view towards improving and/or updating their skills for reinsertion in the labor force; and (3) training of female entrepreneurs to equip them with technical and management skills. The component will also support the transition from school to work for school leavers and graduates. By putting emphasis on micro-enterprises and women's training, the program took into account the fact that the labor market was dominated by very small firms and that women represented 63 percent of the informal sector employment. The decision to target master craftsmen for training was a strategic decision, as it would have a ripple effect deep into the informal sector. Women represented 52 percent of the 100,000 trainees and workers of small informal sector enterprises, small craftsmen, small-scale food processors, and members of agricultural cooperatives that were trained during 1997-99. The average cost per trainee was US$383 in the beginning of the projects implementation and declined to US$260 in 1999.

In this paper we address impacts of the training component of PAFPA measured through skills improvement (and therefore productivity) by beneficiaries' revenue and income. The conclusions drawn are that positive economic impacts are found for some groups as a result of training received, namely women, the agricultural and electronics sectors, firms employing 1-3 individuals and firms with 10 or more employees.

The outline of the study is the following: In section 2 the econometric methods used in the analytical part are outlined. Section 3 describes and presents the data used, and section 4 shows and discusses the results from the econometric analysis. Section 5 concludes the study.

2. Methodology

2.1. The Problem of Program Evaluation

Evaluating a program gives rise to a number of technical problems. What we want to identify is a possible gain from having participated in the program (being "treated"), therefore what we are interested in is:

(1) $$G_i = Y_{1i} - Y_{0i} \mid P_i = 1$$

that is, the difference between the outcome variable when individual *i* is treated and not treated, given the individual participated. The estimate of the true mean gain for the population is:

(2) $$G = E(Y_{1i} - Y_{0i} \mid P_i = 1)$$

This is termed the "treatment effect" or "the average treatment effect on the treated".
The problem is, however, that the outcome in the case of no participation is unknown that is the "counterfactual." We simply cannot observe what the outcome would have been for the treated in case the person had not been treated ($Y_{0i}|P_i=1$). The "common" error to make in this context is to measure the gain as $G^* = E(Y_{1i} \mid P_i = 1) - (Y_{0i} \mid P_i = 0)$ that is, calculating the gain from the difference in outcomes between the program participants and the nonparticipants.

The existence of a control group makes it possible to calculate $E(Y_{0i}|P=0)$ and if the program actually is randomly assigned, this will equal $E(Y_{0i}|P=1)$, that is the "counterfactual" mean. Actually random assignment means it will equal not only the means but the whole distribution of the outcome variable. The problem is, however, that programs are often, purposely, not randomly assigned, and therefore calculating the mean as G* will not give the right estimate of the impact of a program.

2.2. Ordinary Least Squares Estimation (OLS)

A simple way of evaluating a program is to estimate a simple linear regression of the outcome variable Y_i on the participation variable, P_i, using a cross-section dataset for the post-program period.

Then the model for the nonparticipants is:

$$(4) \qquad Y_i = \alpha + e_{ia}$$

while for the participants it is:

$$(5) \qquad Y_i = \alpha + \beta P_i + e_{ia}$$

where α is a common constant term and P_i an indicator for participation in the program. β is the estimable effect of participation in the program. The problem in using this very simple approach is that participation may not be completely independent of the outcome, i.e. the program is not randomly assigned so the right-hand side variable (P) is not exogenous and then the estimate of β is not a valid estimate of the effect of the program. Suppose, for example, that individuals with a low income are more likely to want to participate or the program is directly targeted at these. Then the regression coefficient β, which is also the difference in means by participation status, is biased downwards:

$$(6) \qquad E(Y_i \mid P_i = 1) - E(Y_i \mid P_i = 0) = \beta + \{E(e_i \mid P_i = 1) - E(e_i \mid P_i = 0)\} < \beta$$

The term in {} is negative, because the individuals that are more likely to participate have lower earnings, and therefore the mean error term is smaller than for the nonparticipants.

It is of course, possible to estimate the model controlling for other explanatory variables. Then the model is:

$$(7) \qquad Y_i = \alpha + \beta P_i + \gamma X_i + e_i$$

X_i is a vector of observable characteristics of the individual, γ is the estimated effects from these characteristics, and e_i is the error term.

2.3. Double Difference Estimation

A useful tool used for program evaluation is the "double difference" estimator, also labeled the "difference in difference" estimator. In order to be able to use this estimator the data must meet the following requirements: There must be information on both participants and nonparticipants (that is, we need a control group) and all individuals must be observed both before and after the program.

Let Y_{it} be the outcome variable on which we want to measure the effect of the program e.g. total revenue or profits at time t=a,b (after, before).

A simple version of the double difference estimator is the following:

$$DD^s = \left[\frac{1}{P}\sum_{i=1}^{P}(Y_{1ia} - Y_{1ib})\right] - \left[\frac{1}{C}\sum_{j=1}^{C}(Y_{0ja} - Y_{0jb})\right] \tag{10}$$

where P is the number of participants and C is the number of individuals in the control group. Thus, the estimator is the difference between the average changes in the outcome variable for the two groups.

In order to take observable heterogeneity of the individuals into account, the double difference estimator can be calculated from a regression model including other personal characteristics. This is described in what follows.

The value of this variable can be modeled as

$$Y_{ia} = \alpha + \beta P_i + \gamma X_{ia} + e_{ia} \tag{11}$$

Where α is a common error term, P_i an indicator for participation in the program, β is the estimable effect of participation in the program, X_{ia} is a vector of observable characteristics of the individual, γ is the estimated effects from these characteristics, and e_{ia} is the error term.

In the time period before the education the same equation is:

(12) $$Y_{ib} = \alpha + \gamma X_{ib} + e_{ib}$$

The error term consists of two parts:

(13) $$e_{it} = \eta_i + \mu_{it}$$

η_i is a time invariant unobserved individual specific effect which is allowed to be correlated with the participation indicator, P_i. η_{it} is an innovation error, which is assumed to be uncorrelated with all explanatory variables.

What we really are interested in is the *change* in the outcome variable between the two periods, so therefore we take the difference over these two periods:

(14) $$Y_{ia} - Y_{ib} = \beta P_i + \gamma(X_{ia} - X_{ib}) + \mu_{ia} - \mu_{ib}$$

The unobserved individual specific effect is now differenced away and the estimated effects are with respect to *changes*. Furthermore, it is possible to include the *levels* of the explanatory variables, i.e. X_{ia} and X_{ib} and in that manner control for differences in initial conditions. In the current study this is indeed relevant since *none* of the individual characteristics available change over time (because the individual is interviewed only once).

If this model is estimated by OLS the resulting estimates of β and γ are unbiased, because the potential bias from correlation between the unobservables and observables is eliminated as a consequence of the first-differencing. The estimate of β is then the double difference estimate of the impact of the program, taking into account both observable and timeinvariant unobservable heterogeneity.

The structure of the data available for this analysis does, however, not allow for taking first differences. The problem is that only the outcome variable (that is revenue and income) is observed both before and after the program. All other variables are only observed once, that is after the training has taken place. (Note, that first differencing will eliminate all observed characteristics.) Therefore the following model is estimated:

$$Y_{it} = \beta_{PB} PB_{it} + \beta_{PA} PA_{it} + \beta_{NPB} NPB_{it} + \beta_{NPA} NPA_{it} + \gamma X_{it} + \mu_{it} \tag{15}$$

where

$$PB_{it} = \begin{cases} 1 & if \;\; P = 1 \; and \; t = b \\ 0 & otherwise \end{cases} \tag{16}$$

$$PA_{it} = \begin{cases} 1 & if \;\; P = 1 \; and \; t = a \\ 0 & otherwise \end{cases}$$

$$NPB_{it} = \begin{cases} 1 & if \;\; P = 0 \; and \; t = b \\ 0 & otherwise \end{cases}$$

$$NPA_{it} = \begin{cases} 1 & if \;\; P = 0 \; and \; t = a \\ 0 & otherwise \end{cases}$$

In this model, four indicator variables are introduced in order to identify any significant difference in the change of earnings for the individuals that have participated compared to the change of earnings of the individuals that have not participated. The DID estimator, where we control for observed heterogeneity is then:

$$DID^{het} = (\beta_{PA} - \beta_{PB}) - (\beta_{NPA} - \beta_{NPB}) \tag{17}$$

When the model has been estimated, it is simple to test whether this expression is significantly different from zero.[3]

[3] The β–coefficients can also be used to test other hypotheses, e.g. whether the earnings of the treatment group and the control group was significantly different before the program ($\beta_{PB}=\beta_{NPB}$) and whether the changes within the two groups are significant ($\beta_{PA}-\beta_{PB}=0$, $\beta_{NPA}-\beta_{NPB}=0$). (Notice that one of the indicator variables

The model described does, however, not take the panel feature of the data into account (see section 3). The model can be specified as a random effect model by extracting a time invariant individual specific effect from the error term:

(18) $$Y_{it} = \beta_{PB} PB_{it} + \beta_{PA} PA_{it} + \beta_{NPB} NPB_{it} + \beta_{NPA} NPA_{it} + \gamma X_{it} + u_i + \mu_{it}$$

u_i is the random disturbance characterizing the ith observation and is constant through time. We make the following assumptions concerning the nature of this error term:

$$\begin{aligned}
&E[\mu_{it}] = E[u_i] = 0, E[\mu_{it}^2] = \sigma_\mu^2, E[u_{it}^2] = \sigma_u^2, \\
&E[\mu_{it} u_j] = 0 \ \textit{for all } i, t, \textit{ and } j, E[\mu_{it}\mu_{js}] = 0 \textit{ if } t \neq s \textit{ or } i \neq j \\
&E[u_i u_j] = 0 \textit{ if } i \neq j
\end{aligned}$$

The model can easily be estimated by the use of the feasible generalized least squares method.

3. Data

The data available for the evaluation of PAFPA are all collected by use of surveys. The data available for this study consist of 548 individuals where 227 have participated in the program and the remaining 321 individuals are included in the survey as a control group. Each individual was interviewed twice in 1999; one questionnaire about their economic conditions before the program participation and one about their situation after the program (both the beneficiaries and nonbeneficiaries).

In the first round the participating individuals were asked about basic individual information such as age, educational level, duration of work experience within the field of current work, etc. In the second round also nonparticipants, with similar characteristics, were included in order to be able to form a control group.

All individuals were then interviewed after PAFPA had taken place. In this survey the individuals were asked about their economic situation, how many employees they have, etc.,

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should be left out of the model when estimated, in order to avoid perfect collinearity problems. In this case NPA_{it} is the left-out category and hence β_3 is normalized to zero).

before and after the program had taken place. But also more qualitative questions were asked such as why they had arranged themselves in the way they had and what kind of constraints they faced. In the following some very simple measures are presented in order to give an impression of the data.[4]

Table 1. Means and standard deviations of selected variables

	Males		Females		Agriculture		Couture		Electronics	
Variable	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Participation	0.385	0.487	0.469	0.500	0.489	0.502	0.343	0.476	0.425	0.495
Woman	0.000	0.000	1.000	0.000	1.000	0.000	0.221	0.416	0.057	0.232
Illiterate	0.087	0.282	0.719	0.451	0.993	0.085	0.122	0.328	0.039	0.195
Literate	0.427	0.495	0.104	0.306	0.007	0.085	0.558	0.498	0.307	0.462
Education>2	0.486	0.501	0.177	0.383	0.000	0.000	0.320	0.468	0.654	0.477
Age<30	0.407	0.492	0.146	0.354	0.007	0.085	0.376	0.486	0.456	0.499
Age 30-39	0.410	0.493	0.229	0.421	0.158	0.366	0.442	0.498	0.386	0.488
Age 40-49	0.101	0.302	0.224	0.418	0.309	0.464	0.122	0.328	0.061	0.241
Age>49	0.014	0.118	0.323	0.469	0.446	0.499	0.017	0.128	0.009	0.093
Age unknown	0.067	0.251	0.078	0.269	0.079	0.271	0.044	0.206	0.088	0.284
Exp<5	0.183	0.387	0.073	0.261	0.000	0.000	0.050	0.218	0.307	0.462
Exp 5-10	0.250	0.434	0.146	0.354	0.000	0.000	0.320	0.468	0.259	0.439
Exp>10	0.567	0.496	0.781	0.414	1.000	0.000	0.630	0.484	0.434	0.497
Agriculture	0.000	0.000	0.724	0.448	1.000	0.000	0.000	0.000	0.000	0.000
Tailoring	0.396	0.490	0.208	0.407	0.000	0.000	1.000	0.000	0.000	0.000
Electronics	0.604	0.490	0.068	0.252	0.000	0.000	0.000	0.000	1.000	0.000
Abengourou	0.124	0.330	0.010	0.102	0.000	0.000	0.066	0.249	0.149	0.357
Abidjan	0.225	0.418	0.057	0.233	0.000	0.000	0.000	0.000	0.399	0.491
Biankouma	0.000	0.000	0.724	0.448	1.000	0.000	0.000	0.000	0.000	0.000
Bouaké	0.213	0.410	0.099	0.299	0.000	0.000	0.271	0.446	0.202	0.402
Daloa	0.070	0.256	0.005	0.072	0.000	0.000	0.144	0.352	0.000	0.000
Man	0.222	0.416	0.047	0.212	0.000	0.000	0.337	0.474	0.118	0.324
Yamoussoukro	0.146	0.354	0.057	0.233	0.000	0.000	0.182	0.387	0.132	0.339
0 employees	0.197	0.398	0.036	0.188	0.007	0.085	0.238	0.427	0.145	0.353
1-3 employees	0.531	0.500	0.354	0.480	0.259	0.440	0.398	0.491	0.654	0.477
4-6 employees	0.185	0.389	0.188	0.391	0.194	0.397	0.199	0.400	0.171	0.377
7-9 employees	0.039	0.195	0.047	0.212	0.029	0.168	0.083	0.276	0.018	0.132
10+ employees	0.048	0.214	0.375	0.485	0.511	0.502	0.083	0.276	0.013	0.114
CA bef. PAFPA	153907	182031	55749	92322	20497	9855	191405	219294	122813	126325
Revenue bef. PAI	90800	147857	32732	43158	19194	9511	111531	173672	69097	103347
CA aft. PAFPA	157717	197462	60217	102529	20320	11395	206723	248048	120472	118861
Revenue aft. PAF	120241	196303	46492	99085	16475	11566	177950	250479	75585	109739
N	356		192		139		181		228	

In table 1 means and standard deviations are seen for different subgroups in the sample. 192 (35%) of the individuals in the sample are women. The distribution of individuals across

[4] The data have been carefully described in the study of CEPRASS.

sectors shows that 139 (25.4%) individuals (all women) are in the agricultural sector, 182 (33%) are in the tailoring sector, and 228 (41.6%) are in the electronics sector. The participation variable shows that a higher fraction of the women (46.9%) are participants than among men (38.5%). According to the education variables a very high fraction of the women (basically women in the agricultural sector) are illiterate, whereas almost half of the men have an education corresponding to more than secondary level. From the columns of the different sectors it is clear that the sector employing the most highly educated individuals is the electronics sector. The age distribution shows that most males in the sample belongs to the younger age-groups, whereas more women are in the highest age-group, and this tendency is also reflected in the distribution of experience. The firm size (in terms of number of employees) indicators show that a large fraction of the sampled individuals are employed in firms with few employees, however the cooperative nature of the agricultural sector is reflected in the relatively large fraction of firms with 10 or more employees. From the distribution of the outcome variables, namely *chiffres d'affaires* (CA –income) and revenue, it can be seen that the levels for these measures are varying a lot across sectors and hence across gender. The revenue and CA figures for the women and in the agricultural sector are much lower than the outcome for males and in the other sectors. When comparing the numbers across time periods, i.e. before and after PAFPA, we generally see an increasing trend in al columns but one, namely the agricultural sector, where both CA and revenue have declined during PAFPA.

In table 2 similar figures are shown, however, here the sample has been split in order to focus on differences between program participants and nonparticipants. It is seen that the share of women is higher among the beneficiaries than among the nonbenficiaires. This difference is also reflected in the share of illiterate and agricultural sector workers, since the majority of women are in the agricultural sector and are illiterate. There are fewer very young individuals among the participants. The share of agricultural workers participating is higher than the share of agricultural workers among the nonparticpants and the opposite is the case in the tailoring sector. Moreover, 30% of the participants are living in Biankouma, which also reflects the oversampling of participants in the agricultural sector. Finally, we see from the economic variables that at the mean participants are doing slightly better than nonparticipants, both before and after PAFPA.

Table 2. Means and standard deviations for selected variables

	Beneficiaires		Non-beneficiaires	
Variable	Mean	Std. Dev.	Mean	Std. Dev.
Participation	1.000	0.000	0.000	0.000
Woman	0.396	0.490	0.318	0.466
Illiterate	0.330	0.471	0.293	0.456
Literate	0.233	0.424	0.371	0.484
Education>2	0.436	0.497	0.336	0.473
Age<30	0.251	0.435	0.361	0.481
Age 30-39	0.379	0.486	0.324	0.469
Age 40-49	0.128	0.335	0.156	0.363
Age>49	0.141	0.349	0.109	0.312
Age unknown	0.101	0.302	0.050	0.218
Exp<5	0.132	0.339	0.153	0.360
Exp 5-10	0.194	0.396	0.227	0.420
Exp>10	0.674	0.470	0.620	0.486
Agriculture	0.300	0.459	0.221	0.416
Tailoring	0.273	0.447	0.371	0.484
Electronics	0.427	0.496	0.408	0.492
Abengourou	0.093	0.290	0.078	0.268
Abidjan	0.176	0.382	0.159	0.366
Biankouma	0.300	0.459	0.221	0.416
Bouaké	0.159	0.366	0.184	0.388
Daloa	0.053	0.224	0.044	0.205
Man	0.145	0.353	0.171	0.377
Yamoussoukro	0.075	0.264	0.143	0.351
0 employees	0.106	0.308	0.165	0.372
1-3 employees	0.493	0.501	0.452	0.498
4-6 employees	0.247	0.432	0.143	0.351
7-9 employees	0.040	0.196	0.044	0.205
10+ employees	0.115	0.319	0.196	0.398
CA bef. PAFPA	125843	192137	115042	139576
Revenue bef. PAI	71886	154679	69443	98888
CA aft. PAFPA	136666	202277	114286	155341
Revenue aft. PAF	100512	195761	90081	153686
N	227		321	

In table 3 the simple DID-estimates of the impact of PAFPA are presented (see equation 10). The estimated effect CFA for CA is around 11.600 and 8000 CFA for revenue in the full sample, meaning that there is a positive effect in the overall sample. This result also shows when we split the sample across gender. However, when we split the sample according to sectors, the result is that in terms of CA there has been a negative effect from PAFPA in the agricultural sector, and this is also the case in the tailoring sector, when the variable of interest is revenue.

Table 3. Simple Difference-in-difference estimates of the impact of PAFPA

	CA	Revenue	# Beneficiares	# Non-beneficiares
All	11579.12	7987.98	221	327
Men	12300.42	5075.02	137	219
Women	10376.20	16702.25	90	102
Agriculture	-551.79	2731.45	68	71
Tailoring	4569.28	-667.48	62	119
Electronics	28334.98	33519.45	97	131

4. Findings

In this section we report findings of the estimations. All models are estimated both by simple OLS (equation (15)) and as random effects models (equation (18)) and with ln(chiffres d'affaires) and ln(revenue) as dependent variables. The included explanatory variables are various demographic variables suggested in the literature of the human capital theory. First, the estimations are performed by the use of the full sample and subsequently the sample was split in various manners in order to be able to detect differences in the estimates across subgroups, namely gender, sectors, and firm size.

4.1. Presentation of results from estimations using the full sample

In table 4 the findings for a sample of all individuals are presented. In the model of ln (CA) estimated by OLS we see that the education variables are significantly larger than zero ((P>|z|) <0.1), meaning that the *chiffres d'affaires* are higher for the educated than for the illiterate. Also the indicator variables for working in electronics or tailoring are very significant, indicating that the CA is higher in these sectors than it is in agriculture. Furthermore, the indicator variable PA (participants in PAFPA) has significantly higher CA than the CA of the individuals that did not participate. The rest of the included variables do not appear to be relevant determinants of the level of CA. The test indicating whether the participants have gained from PAFPA (PA-PB=-NPB) says that we cannot reject the null hypothesis of no difference in the development of CA of the two groups over the two observed periods, since P>|z| is bigger than 0.1. The general conclusions from the estimated random effects model do not differ much from the conclusions of the OLS. But it should be noted that, although the Breusch and Pagan LM-test indicates that there is unobserved heterogeneity in the model, the conclusion from the random effects model is not valid, due to inconsistency of parameters. This can be seen from the Hausman test statistic being significantly different from zero.

Table 4. Estimation results for all individuals

	ln(CA)						ln(revenue)					
	OLS			Random effects			OLS			Random effects		
	Coef.	SE	P>|z|	Coef.	SE	P>|z|	Coef.	SE	P>|z|	Coef.	SE	P>|z|
woman	0.01	0.13	0.96	0.02	0.18	0.90	-0.17	0.13	0.17	-0.19	0.16	0.22
can read	0.37	0.17	0.02	0.33	0.22	0.14	0.03	0.16	0.86	0.03	0.19	0.90
education>2	0.57	0.18	0.00	0.52	0.24	0.03	0.10	0.17	0.54	0.08	0.20	0.71
age 30-39	0.04	0.11	0.72	0.01	0.14	0.93	-0.18	0.10	0.07	-0.19	0.12	0.13
age 40-49	-0.09	0.15	0.54	-0.12	0.20	0.54	-0.13	0.14	0.35	-0.14	0.17	0.41
age>49	-0.08	0.17	0.63	-0.12	0.24	0.60	-0.21	0.16	0.19	-0.26	0.20	0.20
age unknown	0.11	0.16	0.50	0.08	0.21	0.72	0.01	0.15	0.95	0.00	0.18	1.00
exp. 5-10	0.02	0.17	0.93	0.01	0.23	0.98	0.17	0.16	0.29	0.20	0.20	0.30
exp.>10	0.27	0.20	0.17	0.26	0.27	0.34	0.43	0.18	0.02	0.45	0.23	0.05
couture	1.55	0.21	0.00	1.56	0.29	0.00	1.72	0.20	0.00	1.66	0.25	0.00
electronics	1.13	0.24	0.00	1.22	0.32	0.00	1.01	0.23	0.00	0.98	0.28	0.00
Abidjan	0.21	0.18	0.24	0.16	0.24	0.51	0.28	0.17	0.09	0.26	0.21	0.20
PB	0.16	0.10	0.13	0.21	0.10	0.04	-0.01	0.10	0.89	0.03	0.10	0.77
PA	0.21	0.10	0.04	0.24	0.10	0.02	0.19	0.10	0.05	0.20	0.10	0.04
NPB	0.00	0.09	1.00	0.01	0.04	0.84	-0.12	0.09	0.15	-0.09	0.06	0.13
constant	9.45	0.28	0.00	9.45	0.37	0.00	9.45	0.26	0.00	9.45	0.32	0.00
PB-NPB=0	2.35		0.13	3.78		0.05	1.35		0.25	1.59		0.21
PA-PB=0	0.21		0.65	0.29		0.59	4.01		0.05	5.71		0.02
PA-PB=-NPB	0.12		0.73	0.30		0.53	0.37		0.54	0.72		0.40
B&P LM-test				324.2		0.00				97.17		0.00
Hausman-test				38.20		0.00				19.40		0.00
N	1073			1073			1073			1073		

The results from the estimation using ln(revenue) as the dependent variable do not differ much from the estimations with ln(CA) as dependent variable. Again sector indicators come out highly significant, indicating that the revenue of the sectors of electronics and tailoring are higher than in the agricultural sector. However, the educational level does not play a role as determinants of revenue. Again the participants have a higher level of the outcome variable (CA/revenue) than the nonparticipants after the program participation. The test of PA-PB=0 rejects the null of no change in the revenue for the participants. This change, however, is not significantly different from the change of revenue of the nonparticipants, because the test of PA-PB=NPA-NPB (beneficiary of PAFPA after minus before the program equals nonbeneficiary of PAFPA after minus before the program) is not rejected. Also in this case the results of the random effects model should be taken with caution, since the Hausman test rejects consistency of the parameters.

4.2. Presentation of results from estimations by gender

Table 5 and 6 present findings of the estimations by gender. Even though the gender indicator was not significantly different from zero in the estimation on the total sample, there may be some gender differences in coefficients. In table 5 the findings for males can be seen. Firstly, notice the model specification tests show that there is unobserved heterogeneity in the model and that the parameters of the random effects model are now tested to be consistently estimated. Therefore, the focus of comments and conclusions from this model will be on the random effects specification. In the random effects model of CA the only personal characteristic significantly different from zero is the indicator variable for being employed in the electronic sector relative to the sector of tailoring. Furthermore, it can be concluded that the participants of the program earned more both before and after the program than the nonparticipants did after the program. The test of the estimate of the participation effect, however, does not differ significantly from zero. In the specification where ln(revenue) is the dependent variable there is a negative effect from being aged 30-39 relative to being younger, but a positive effect from having more than 10 years of work experience in the job. The participation indicators show that the nonparticipants earned less before the program had run than after. The tests show also that the revenue of the participants had risen, but not significantly more than the revenue of the nonparticipants. From table 6 it can be seen, that also for the women the random effects specification is preferred to the OLS model. Hence, we concentrate on the results of the random effects model. When modeling the CA significant explanatory variables are the sector indicators, again indicating that women in electronics and tailoring generate more revenue than women in the agricultural sector do. None of the tests of the participation effects show differences in the levels of earnings before and after the program, neither for participants nor nonparticipants.

Table 5. Estimation results for males

	ln(CA)						ln(revenue)					
	OLS			Random effects			OLS			Random effects		
	Coef.	SE	P>|z|	Coef.	SE	P>|z|	Coef.	SE	P>|z|	Coef.	SE	P>|z|
can read	0.35	0.21	0.09	0.32	0.28	0.25	0.02	0.17	0.93	0.00	0.21	1.00
education>2	0.50	0.22	0.03	0.47	0.30	0.12	0.05	0.18	0.77	0.03	0.23	0.91
age 30-39	-0.02	0.14	0.86	-0.04	0.18	0.82	-0.27	0.11	0.02	-0.27	0.14	0.05
age 40-49	-0.12	0.20	0.55	-0.14	0.27	0.61	-0.10	0.17	0.56	-0.11	0.21	0.60
age>49	-0.25	0.48	0.61	-0.27	0.65	0.67	-0.74	0.48	0.12	-0.87	0.57	0.12
age unknown	0.11	0.22	0.63	0.08	0.29	0.80	0.00	0.18	0.98	-0.01	0.23	0.96
exp. 5-10	-0.01	0.22	0.95	-0.01	0.29	0.98	0.17	0.18	0.35	0.22	0.22	0.34
exp.>10	0.29	0.25	0.25	0.28	0.34	0.41	0.49	0.21	0.02	0.54	0.26	0.04
electronics	-0.38	0.12	0.00	-0.36	0.16	0.02	-0.68	0.10	0.00	-0.67	0.12	0.00
Abidjan	0.23	0.22	0.30	0.21	0.30	0.49	0.29	0.18	0.11	0.30	0.23	0.19
PB	0.29	0.15	0.05	0.33	0.15	0.03	-0.07	0.13	0.55	-0.05	0.13	0.69
PA	0.34	0.15	0.02	0.36	0.15	0.02	0.20	0.13	0.12	0.18	0.13	0.15
NPB	-0.01	0.13	0.96	0.01	0.05	0.85	-0.26	0.11	0.02	-0.24	0.07	0.00
constant	11.00	0.30	0.00	11.01	0.40	0.00	11.23	0.25	0.00	11.18	0.31	0.00
PB-NPB=0	3.96		0.05	4.36		0.04	2.24		0.13	2.26		0.13
PA-PB=0	0.09		0.77	0.22		0.64	3.96		0.05	6.39		0.01
PA-PB=-NPB	0.04		0.84	0.23		0.63	0.00		0.10	0.00		0.96
B&P LM-test				30.83		0.00				80.53		0.00
Hausman-test				0.96		0.62				2.12		0.35
N	696			696			696			696		

In the specification where ln(revenue) is the dependent variable again the tailors have significantly higher earnings than workers in the agricultural sector. Furthermore, it should be noticed that the participants after PAFPA earn more than the nonparticipants, and that the revenue of the participants has actually fallen during the period. So even though the participants do not have higher revenues after the program than they had before, the negative trend has been avoided. This can also be seen from the test of the DID-estimate showing that at a 7% level of significance it can be concluded that the female participants of PAFPA have experienced a positive impact on revenue.

Table 6. Estimation results for females

	ln(CA)						ln(revenue)					
	OLS			Random effects			OLS			Random effects		
	Coef.	SE	P>|z|	Coef.	SE	P>|z|	Coef.	SE	P>|z|	Coef.	SE	P>|z|
can read	0.05	0.57	0.92	-0.03	0.77	0.97	-0.39	0.77	0.61	-0.46	0.94	0.63
education>2	0.42	0.59	0.48	0.43	0.80	0.59	-0.10	0.80	0.91	-0.13	0.99	0.89
age 30-39	0.23	0.19	0.22	0.16	0.25	0.51	0.23	0.25	0.36	0.18	0.31	0.55
age 40-49	0.08	0.22	0.70	-0.01	0.30	0.97	0.08	0.30	0.79	0.01	0.37	0.97
age>49	0.09	0.21	0.67	-0.01	0.29	0.98	0.09	0.29	0.76	0.00	0.36	0.99
age unknown	0.30	0.22	0.17	0.23	0.30	0.44	0.24	0.30	0.43	0.20	0.37	0.59
exp. 5-10	0.12	0.26	0.63	0.10	0.35	0.77	0.26	0.35	0.45	0.25	0.42	0.55
exp.>10	0.17	0.32	0.60	0.17	0.43	0.69	0.05	0.43	0.91	-0.01	0.53	0.98
couture	1.73	0.59	0.00	1.68	0.80	0.04	1.74	0.80	0.03	1.64	0.98	0.10
electronics	1.01	0.70	0.15	1.85	0.87	0.03	0.64	0.94	0.50	1.20	1.12	0.29
Abidjan	0.35	0.50	0.49	-0.57	0.52	0.27	0.70	0.68	0.30	-0.06	0.74	0.94
PB	-0.06	0.11	0.60	-0.04	0.12	0.75	0.15	0.15	0.33	0.20	0.16	0.21
PA	-0.01	0.11	0.93	-0.02	0.12	0.87	0.26	0.15	0.09	0.29	0.16	0.07
NPB	0.01	0.11	0.91	0.01	0.06	0.92	0.16	0.14	0.27	0.20	0.11	0.06
constant	9.49	0.32	0.00	9.57	0.43	0.00	9.25	0.44	0.00	9.35	0.53	0.00
PB-NPB=0	0.41		0.52	0.14		0.71	0.01		0.93	0.00		0.97
PA-PB=0	0.19		0.67	0.09		0.77	0.53		0.47	0.58		0.45
PA-PB=-NPB	0.16		0.69	0.08		0.78	1.68		0.20	3.32		0.07
B&P LM-test				79.17		0.00				20.77		0.00
Hausman-test				0.00		1.00				0.00		1.00
N	696			696			696			696		

4.3. Presentation of Results from Estimations by Sector

In all the models estimated the sector indicators appear to be highly significant. Therefore the models have been estimated separately for the three observed sectors. In table 7 the models estimated for the agricultural sector are presented. Again, the OLS-specifications are rejected, so all conclusions will be made from the random effects model. In the model of ln(CA) the only significant explanatory variables are PB and PA, indicating that the CA of the participants were lower both before and after PAFPA compared to the CA of the nonparticipants after PAFPA. The test of PB=NPB actually shows that the CA of the participants were also lower than the CA of the nonparticipants before PAFPA. On the basis of the test of the DID-estimate it is concluded that no impact from the program can be found. When we consider the random effects model of ln(revenue) the coefficients of PB and NPB indicates that the revenue of both groups were higher before PAFPA than the revenue of the nonparticipants after PAFPA. The revenue of the participants, however, has not changed significantly over the period and these conclusions together lead to a conclusion of a positive effect of PAFPA in the agricultural sector, when the outcome variable is revenue. This corresponds to the conclusion of the women, and since all sampled individuals of the agricultural sector are in fact women, the conclusion is no surprise.

Table 7. Estimation results for the agricultural sector

	ln(CA)						ln(revenue)					
	OLS			Random effects			OLS			Random effects		
	Coef.	SE	P>|z|	Coef.	SE	P>|z|	Coef.	SE	P>|z|	Coef.	SE	P>|z|
can read	-0.34	0.50	0.51	-0.36	0.67	0.60	-0.60	0.68	0.38	-0.63	0.84	0.46
age 30-39	-0.07	0.19	0.72	-0.04	0.25	0.89	0.09	0.25	0.71	0.14	0.32	0.67
age 40-49	-0.22	0.17	0.19	-0.24	0.23	0.30	-0.09	0.23	0.68	-0.10	0.29	0.74
age>49	-0.22	0.17	0.19	-0.24	0.22	0.28	-0.09	0.23	0.70	-0.11	0.28	0.69
PB	-0.20	0.12	0.08	-0.21	0.12	0.08	0.32	0.16	0.05	0.30	0.16	0.07
PA	-0.21	0.12	0.07	-0.25	0.12	0.04	0.25	0.16	0.11	0.22	0.16	0.19
NPB	0.01	0.11	0.91	0.01	0.06	0.84	0.50	0.15	0.00	0.50	0.11	0.00
constant	10.05	0.18	0.00	10.07	0.23	0.00	9.34	0.24	0.00	9.37	0.29	0.00
PB-NPB=0	3.38		0.07	3.43		0.06	1.27		0.26	1.49		0.22
PA-PB=0	0.01		0.94	0.27		0.61	0.16		0.69	0.48		0.49
PA-PB=-NPB	0.00		0.98	0.05		0.82	3.85		0.05	6.79		0.01
B&P LM-test				59.61		0.00				28.65		0.00
Hausman-test				0.00		1.00				0.00		1.00
N	274			274			274			274		

In table 8 the similar estimation results from the sector of tailoring can be seen. In the random effects model of CA no explanatory variables seem to have impact on the CA. Furthermore, there are no differences between the participants and the nonparticipants and neither between the development of their CA in the period. From the estimations of the revenue of the tailors it can be concluded that both groups have experienced a rise in the revenue during the period, but since these changes are concluded not to be significantly different from each other, no impact of PAFPA is found.

Table 8. Estimation results for the tailoring sector

	ln(CA)						ln(revenue)					
	OLS			Random effects			OLS			Random effects		
	Coef.	SE	P>|z|	Coef.	SE	P>|z|	Coef.	SE	P>|z|	Coef.	SE	P>|z|
woman	0.00	0.25	0.99	-0.01	0.34	0.97	-0.22	0.17	0.21	-0.22	0.22	0.31
can read	0.35	0.32	0.27	0.31	0.43	0.48	-0.08	0.22	0.72	-0.08	0.28	0.76
education>2	0.76	0.37	0.04	0.73	0.50	0.14	0.16	0.25	0.53	0.14	0.32	0.65
age 30-39	0.12	0.25	0.62	0.09	0.34	0.79	-0.22	0.17	0.20	-0.25	0.22	0.25
age 40-49	0.13	0.36	0.71	0.08	0.48	0.86	0.27	0.25	0.27	0.26	0.31	0.40
age>49	0.07	0.78	0.92	0.03	1.07	0.98	-0.23	0.62	0.71	-0.25	0.80	0.76
age unknown	-0.43	0.51	0.40	-0.44	0.66	0.50	-0.62	0.38	0.11	-0.70	0.46	0.12
exp. 5-10	-0.49	0.44	0.26	-0.49	0.59	0.40	-0.11	0.30	0.72	-0.12	0.38	0.75
exp.>10	-0.26	0.47	0.57	-0.25	0.62	0.69	-0.04	0.32	0.90	-0.02	0.40	0.96
PB	0.31	0.27	0.25	0.35	0.28	0.22	-0.38	0.19	0.05	-0.37	0.20	0.06
PA	0.39	0.28	0.16	0.40	0.28	0.15	-0.02	0.19	0.92	-0.04	0.20	0.85
NPB	-0.12	0.22	0.58	-0.10	0.09	0.28	-0.52	0.15	0.00	-0.50	0.10	0.00
constant	11.39	0.54	0.00	11.40	0.70	0.00	11.82	0.36	0.00	11.81	0.45	0.00
PB-NPB=0	2.51		0.11	2.47		0.12	0.49		0.48	0.47		0.50
PA-PB=0	0.07		0.80	0.22		0.64	2.95		0.09	5.61		0.02
PA-PB=-NPB	0.01		0.91	0.07		0.79	0.35		0.55	0.98		0.32
B&P LM-test				22.09						47.51		0.00
Hausman-test				0.33		0.89				0.72		0.70
N	336			336			336			336		

Finally, the results for the electronics sector are presented in table 9. From the results of the random effects model it can be seen that CA of the older and more experienced workers are higher than for the younger and less experienced. Living in Abidjan also results in a higher level of CA than for those in the electronic sector living outside Abidjan. The coefficients of the PB and PA variables are significantly positive and this leads to the conclusion that the participants have higher CA both before and after PAFPA than the nonparticipants have after the program. Furthermore, nonparticpants had a higher CA before the program than after. The nonparticipants did not experience this decline in their CA, and these facts together lead to the conclusion that the participants have experienced a positive impact from PAFPA (at least at a 9% level of significance). The results from the random effects model of revenue also shows positive effects from age, experience, and living in Abidjan. The coefficient of PA is significantly positive indicating that the participants have higher revenues than nonparticipants do after PAFPA. It is also seen that the revenues of the participants have risen, however, it cannot be concluded that this rise differs significantly from the development of the nonparticipants. Hence, we cannot conclude that there has been any impact of PAFPA on the revenues in the electronic sector.

Table 9. Estimation results for the electronics sector

	ln(CA)						ln(revenue)					
	OLS			Random effects			OLS			Random effects		
	Coef.	SE	P>|z|	Coef.	SE	P>|z|	Coef.	SE	P>|z|	Coef.	SE	P>|z|
woman	-0.18	0.17	0.32	-0.17	0.23	0.45	-0.25	0.24	0.29	-0.29	0.28	0.31
can read	0.40	0.24	0.10	0.39	0.32	0.22	0.51	0.30	0.09	0.49	0.37	0.19
education>2	0.37	0.24	0.13	0.36	0.32	0.26	0.42	0.29	0.16	0.40	0.37	0.28
age 30-39	-0.14	0.11	0.19	-0.15	0.14	0.28	-0.19	0.14	0.17	-0.21	0.17	0.22
age 40-49	-0.35	0.19	0.06	-0.35	0.25	0.16	-0.56	0.24	0.02	-0.60	0.29	0.04
age>49	-0.63	0.49	0.20	-0.64	0.65	0.32	-1.18	0.79	0.14	-1.22	0.83	0.14
age unknown	0.36	0.15	0.02	0.36	0.20	0.07	0.33	0.18	0.08	0.37	0.23	0.11
exp. 5-10	0.25	0.15	0.10	0.26	0.20	0.20	0.26	0.19	0.17	0.32	0.23	0.18
exp.>10	0.62	0.19	0.00	0.61	0.25	0.01	0.86	0.23	0.00	0.90	0.29	0.00
Abidjan	0.44	0.16	0.01	0.42	0.21	0.05	0.51	0.20	0.01	0.50	0.25	0.04
PB	0.25	0.12	0.03	0.27	0.12	0.02	0.10	0.15	0.49	0.15	0.15	0.32
PA	0.32	0.11	0.01	0.32	0.12	0.01	0.39	0.15	0.01	0.41	0.15	0.01
NPB	0.09	0.10	0.40	0.09	0.05	0.08	-0.10	0.13	0.44	-0.06	0.10	0.53
constant	10.42	0.29	0.00	10.43	0.38	0.00	9.74	0.36	0.00	9.69	0.44	0.00
PB-NPB=0	2.08		0.15	2.36		0.12	2.00		0.16	2.06		0.15
PA-PB=0	0.29		0.59	0.58		0.45	3.59		0.06	5.46		0.02
PA-PB=1	0.91		0.34	2.93		0.09	0.85		0.36	1.81		0.18
B&P LM-test				18.40		0.00				35.12		
Hausman-test				0.00		1.00				5.43		0.07
N	422			422			422			422		

4.4. Presentation of results from estimations by number of employees

Behavior in different kinds of establishments may also effect the earnings formation in different ways. Therefore models similar to the ones previously presented are estimated for different sizes of firms, splitting up firms by the number of employees.

Table 10. Estimation results for “firms” with no employees

	ln(CA)						ln(revenue)					
	OLS			Random effects			OLS			Random effects		
	Coef.	SE	P>|z|	Coef.	SE	P>|z|	Coef.	SE	P>|z|	Coef.	SE	P>|z|
woman	0.50	0.75	0.50	0.43	0.97	0.66	0.09	0.40	0.82	0.07	0.44	0.88
can read	4.30	1.24	0.00	4.24	1.67	0.01	-1.06	0.62	0.09	-1.03	0.72	0.15
education>2	5.09	1.37	0.00	5.00	1.82	0.01	-1.16	0.68	0.09	-1.10	0.79	0.17
age 30-39	-0.10	0.47	0.84	-0.14	0.63	0.82	-0.68	0.24	0.01	-0.67	0.28	0.02
age 40-49	0.66	0.77	0.39	0.58	1.00	0.56	-0.33	0.40	0.41	-0.28	0.46	0.54
age>49	5.38	1.70	0.00	5.29	2.30	0.02	-1.36	0.84	0.11	-1.29	0.99	0.19
age unknown	0.13	0.63	0.84	0.13	0.83	0.88	-0.30	0.33	0.37	-0.36	0.38	0.35
exp. 5-10	-0.32	0.85	0.71	-0.39	1.10	0.72	-0.05	0.42	0.91	-0.05	0.48	0.92
exp.>10	0.16	0.97	0.87	0.03	1.24	0.98	0.39	0.48	0.42	0.39	0.55	0.48
couture	-2.17	2.20	0.33	-2.19	2.95	0.46	2.79	1.10	0.01	2.69	1.27	0.03
electronics	-2.06	2.31	0.37	-2.07	3.08	0.50	2.18	1.16	0.06	2.12	1.34	0.11
Abidjan	0.02	0.83	0.98	-0.08	1.09	0.95	0.37	0.41	0.37	0.35	0.47	0.46
PB	0.53	0.56	0.35	0.64	0.56	0.25	-0.11	0.29	0.71	-0.11	0.30	0.72
PA	0.59	0.55	0.29	0.62	0.56	0.27	0.12	0.29	0.68	0.09	0.29	0.77
NPB	-0.45	0.43	0.29	-0.35	0.19	0.06	-0.43	0.22	0.05	-0.41	0.18	0.03
constant	8.31	2.08	0.00	8.49	2.75	0.00	9.59	1.03	0.00	9.63	1.19	0.00
PB-NPB=0	3.05		0.08	3.11		0.08	1.22		0.27	1.03		0.31
PA-PB=0	0.01		0.92	0.01		0.94	0.45		0.50	0.45		0.50
PA-PB=-NPB	0.26		0.61	1.25		0.26	0.27		0.61	0.39		0.53
B&P LM-test				49.29		0.00				2.25		0.13
Hausman-test				1.47		0.48				0.00		1.00
N	175			175			175			175		

In table 10 we see the findings of the estimations for single-individual firms. For the models of ln(CA) we observe that the random effects model is appropriate. Individuals having higher levels of education and are older than 49 years have a significantly higher level of CA than those who do not. Concerning PAFPA, it is seen that the CA of the nonparticipants have increased significantly during PAFPA period and that the level of CA has been unchanged for the participants. However, there does not appear to be any significant difference in the change of CA between the two groups, i.e. no effect of PAFPA is detected. For the model having ln(revenue) as a dependent variable, the random effects model is rejected, i.e. the OLS model is to be used when interpreting the results. Again there are significant effects from education and age variables and here also the sector indicators come out significantly. The revenue of the nonparticipants has also risen during the period, but again we see no effects from the program participation.

Table 11. Estimation results for "firms" with 1-3 employees

	ln(CA)						ln(revenue)					
	OLS			Random effects			OLS			Random effects		
	Coef.	SE	P>|z|	Coef.	SE	P>|z|	Coef.	SE	P>|z|	Coef.	SE	P>|z|
woman	-0.18	0.13	0.15	-0.17	0.17	0.30	-0.13	0.16	0.42	-0.22	0.20	0.29
can read	0.26	0.17	0.13	0.25	0.23	0.28	0.08	0.22	0.71	0.09	0.28	0.74
education>2	0.43	0.18	0.02	0.42	0.24	0.08	0.27	0.23	0.23	0.27	0.29	0.36
age 30-39	-0.10	0.10	0.35	-0.10	0.14	0.45	-0.21	0.13	0.11	-0.23	0.17	0.18
age 40-49	0.04	0.18	0.83	0.04	0.24	0.88	-0.05	0.22	0.83	-0.09	0.28	0.74
age>49	-0.14	0.21	0.50	-0.17	0.28	0.56	-0.19	0.28	0.49	-0.28	0.35	0.42
age unknown	0.28	0.15	0.07	0.28	0.21	0.17	0.19	0.19	0.33	0.24	0.25	0.34
exp. 5-10	0.37	0.15	0.01	0.38	0.20	0.06	0.52	0.19	0.01	0.57	0.24	0.02
exp.>10	0.40	0.18	0.03	0.41	0.25	0.10	0.63	0.23	0.01	0.66	0.30	0.03
couture	1.79	0.23	0.00	1.80	0.31	0.00	1.73	0.31	0.00	1.61	0.39	0.00
electronics	1.12	0.24	0.00	1.14	0.33	0.00	0.92	0.33	0.01	0.77	0.41	0.06
Abidjan	0.37	0.16	0.02	0.36	0.22	0.10	0.45	0.20	0.03	0.43	0.26	0.10
PB	0.29	0.11	0.01	0.29	0.11	0.01	0.09	0.14	0.52	0.15	0.15	0.32
PA	0.34	0.11	0.00	0.33	0.11	0.00	0.31	0.14	0.03	0.34	0.15	0.02
NPB	0.13	0.10	0.18	0.13	0.05	0.01	-0.20	0.12	0.10	-0.16	0.08	0.06
constant	9.31	0.29	0.00	9.30	0.38	0.00	9.09	0.37	0.00	9.16	0.46	0.00
PB-NPB=0	2.15		0.14	2.17		0.14	4.59		0.03	4.44		0.04
PA-PB=0	0.20		0.65	0.52		0.47	2.55		0.11	4.36		0.04
PA-PB=-NPB	1.52		0.22	5.45		0.02	0.01		0.92	0.08		0.77
B&P LM-test				149.3		0.00				55.29		0.00
Hausman-test				0.00		1.00				11.09		0.00
N	510			510			510			510		

From the random effects model of ln(CA) for firms with 1-3 employees in table 11 it is seen that educational level, experience, working in the tailoring or electronics sector, and living in Abidjan all have positive significant impact on the level of CA. With respect to the training indicators we see that the level of CA is the same for nonparticipants and participants before the training program, whereas afterwards the participants have maintained their CA, but the CA of the nonparticipants has declined. This leads to the conclusion that participants have gained from participation in PAFPA, which is confirmed by the formal test.

In table 12 the findings for the somewhat larger firms are presented, namely the firms having 4-6 individuals employed. Generally we do not see much evidence of variation in earnings due to the observable variables included. Actually the only variables significantly different from zero in the appropriate specification of ln(CA) is the indicator variable for the tailoring sector. The participation variables are not significant at all, and hence we cannot identify any effects from program participation. In the random effects model of ln(revenue) the same conclusion is drawn.

Table 12. Estimation results for “firms” with 4-6 employees

	ln(CA)						ln(revenue)					
	OLS			Random effects			OLS			Random effects		
	Coef.	SE	P>|z|	Coef.	SE	P>|z|	Coef.	SE	P>|z|	Coef.	SE	P>|z|
woman	-0.50	0.25	0.05	-0.50	0.33	0.14	-0.58	0.31	0.06	-0.58	0.39	0.14
can read	0.03	0.26	0.91	-0.01	0.34	0.97	-0.01	0.32	0.98	-0.02	0.39	0.96
education>2	0.25	0.28	0.37	0.22	0.36	0.55	0.13	0.34	0.70	0.12	0.42	0.78
age 30-39	-0.15	0.20	0.46	-0.17	0.26	0.52	-0.25	0.24	0.30	-0.28	0.30	0.36
age 40-49	-0.51	0.25	0.04	-0.51	0.33	0.13	-0.69	0.31	0.03	-0.70	0.39	0.07
age>49	-0.46	0.31	0.14	-0.47	0.41	0.25	-0.57	0.38	0.14	-0.64	0.48	0.19
age unknown	-0.46	0.46	0.32	-0.47	0.61	0.44	-0.70	0.59	0.24	-0.75	0.74	0.31
exp. 5-10	-0.67	0.35	0.06	-0.66	0.46	0.15	-0.90	0.43	0.04	-0.87	0.54	0.11
exp.>10	-0.34	0.35	0.32	-0.37	0.46	0.42	-0.61	0.43	0.16	-0.60	0.54	0.27
couture	1.49	0.38	0.00	1.51	0.50	0.00	1.01	0.47	0.03	0.95	0.58	0.10
electronics	0.88	0.44	0.05	0.92	0.59	0.12	0.38	0.55	0.48	0.33	0.68	0.63
Abidjan	-0.73	0.41	0.08	-0.75	0.55	0.17	-0.12	0.54	0.82	-0.09	0.68	0.90
PB	-0.01	0.17	0.96	0.05	0.18	0.79	-0.20	0.21	0.36	-0.20	0.22	0.37
PA	-0.01	0.17	0.98	0.04	0.18	0.84	-0.02	0.22	0.92	-0.07	0.22	0.77
NPB	-0.13	0.17	0.45	-0.09	0.10	0.36	-0.23	0.22	0.30	-0.22	0.15	0.14
constant	11.14	0.47	0.00	11.14	0.62	0.00	11.63	0.59	0.00	11.69	0.73	0.00
PB-NPB=0	0.51		0.48	0.61		0.44	0.02		0.89	0.01		0.92
PA-PB=0	0.00		0.98	0.01		0.90	0.83		0.36	1.02		0.31
PA-PB=-NPB	0.30		0.59	0.58		0.45	0.03		0.86	0.19		0.66
B&P LM-test				37.96		0.00				25.27		0.00
Hausman-test				0.00		1.00				0.00		1.00
N	200.00			200.00			200.00			200.00		

Table 13 shows the findings for firms with 7-9 employees. Again only the sectorial indicators are significant and none of the coefficients of the participation variables come out significantly neither in the models of ln(CA) nor in the models of ln(revenue). Hence, the conclusion is that for these mid-size firms PAFPA has not changed anything in terms of CA or revenue.

In table 14 the results of the larger firms are presented. In the random effects specification of ln(CA) the coefficients of the education variables and the sector variables are significantly positive and the coefficients of PB and PA are significantly negative, meaning that the CA of the nonparticipants is higher than the CA of the participants. For both the participants and the nonparticipants there is no evidence of change in the level of CA during PAFPA period, and hence no program impact is detected. In the case of ln(revenue) the outcome is slightly different. The coefficient of experience is significantly positive and so are the coefficients of the sector indicators. Furthermore, the indicators of the “before PAFPA” variables of both groups are significantly different from zero, but with opposite signs. The conclusion is that

Table 13. Estimation results for “firms” with 7-9 employees

	ln(CA)						ln(revenue)					
	OLS			Random effects			OLS			Random effects		
	Coef.	SE	P>|z|	Coef.	SE	P>|z|	Coef.	SE	P>|z|	Coef.	SE	P>|z|
woman	-0.64	0.29	0.04	-0.71	0.38	0.06	-0.81	0.41	0.06	-0.82	0.51	0.11
can read	-1.24	0.60	0.05	-1.26	0.82	0.13	-1.62	0.86	0.07	-1.61	1.09	0.14
education>2	-1.18	0.60	0.06	-1.18	0.83	0.16	-0.94	0.87	0.29	-0.96	1.10	0.39
age 30-39	-0.42	0.39	0.30	-0.44	0.54	0.41	0.07	0.56	0.90	0.06	0.72	0.93
age 40-49	-0.77	0.48	0.12	-0.77	0.66	0.25	-0.24	0.69	0.73	-0.26	0.88	0.77
exp. 5-10	0.30	0.40	0.46	-0.28	0.55	0.61	-0.65	0.57	0.27	-0.63	0.73	0.39
couture	2.94	0.61	0.00	2.86	0.83	0.00	3.09	0.87	0.00	3.07	1.11	0.01
electronics	2.18	0.72	0.01	2.13	0.98	0.03	2.46	1.03	0.02	2.49	1.30	0.06
PB	-0.32	0.35	0.36	-0.34	0.41	0.41	-0.45	0.50	0.37	-0.44	0.56	0.43
PA	-0.40	0.36	0.27	-0.43	0.42	0.30	-0.33	0.50	0.52	-0.31	0.56	0.58
NPB	0.15	0.26	0.57	0.11	0.17	0.54	0.12	0.37	0.75	0.13	0.30	0.65
constant	10.68	0.60	0.00	11.08	0.87	0.00	10.26	0.93	0.00	10.28	1.16	0.00
PB-NPB=0	1.79		0.19	1.17		0.28	1.34		0.26	1.05		0.30
PA-PB=0	0.06		0.80	0.19		0.66	0.08		0.78	0.13		0.72
PA-PB=-NPB	0.02		0.88	0.00		0.97	0.18		0.67	0.33		0.57
B&P LM-test				3.81		0.05				1.47		0.23
Hausman-test				0.92		0.63				0.05		0.98
N	44			44			44			44		

Table 14. Estimation results for “firms” with 10 or more employees

	ln(CA)						ln(revenue)					
	OLS			Random effects			OLS			Random effects		
	Coef.	SE	P>|z|	Coef.	SE	P>|z|	Coef.	SE	P>|z|	Coef.	SE	P>|z|
woman	1.53	0.70	0.03	1.54	0.96	0.11	0.65	0.99	0.51	0.65	1.18	0.58
can read	0.88	0.32	0.01	0.89	0.44	0.04	0.26	0.45	0.56	0.27	0.54	0.62
education>2	1.20	0.49	0.02	1.20	0.68	0.08	1.26	0.70	0.08	1.25	0.84	0.13
age 30-39	0.24	0.32	0.46	0.25	0.45	0.57	0.43	0.46	0.35	0.45	0.55	0.41
age 40-49	0.16	0.34	0.65	0.14	0.47	0.76	0.47	0.48	0.33	0.45	0.58	0.43
age>49	0.16	0.34	0.65	0.16	0.48	0.75	0.39	0.49	0.43	0.37	0.58	0.53
age unknown	0.75	0.42	0.08	0.76	0.58	0.19	0.94	0.59	0.12	0.93	0.71	0.19
exp. 5-10	1.70	0.91	0.06	1.67	1.25	0.18	2.86	1.29	0.03	2.85	1.54	0.06
exp.>10	-0.08	0.71	0.90	-0.11	0.98	0.91	0.35	1.00	0.73	0.33	1.20	0.79
couture	3.02	0.75	0.00	3.02	1.05	0.00	2.22	1.07	0.04	2.19	1.28	0.09
electronics	3.25	0.84	0.00	3.26	1.16	0.01	2.81	1.19	0.02	2.80	1.42	0.05
PB	-0.63	0.19	0.00	-0.64	0.21	0.00	-0.47	0.28	0.09	-0.48	0.29	0.10
PA	-0.48	0.20	0.02	-0.51	0.21	0.02	-0.29	0.28	0.30	-0.31	0.29	0.28
NPB	0.04	0.14	0.75	0.04	0.06	0.49	0.31	0.19	0.12	0.31	0.15	0.05
constant	8.23	0.79	0.00	8.25	1.09	0.00	8.01	1.12	0.00	8.05	1.33	0.00
PB-NPB=0	12.19		0.00	10.64		0.00	7.83		0.01	7.45		0.01
PA-PB=0	0.49		0.48	1.73		0.19	0.30		0.58	0.44		0.51
PA-PB=-NPB	0.59		0.45	2.19		0.14	1.68		0.20	2.58		0.11
B&P LM-test				49.99		0.00				9.98		0.00
Hausman-test				0.00		1.00				0.00		1.00
N	175			175			175			175		

the revenue of the participants has been constant in the period, whereas the revenue of the nonparticipants has declined, leading to a conclusion that PAFPA has had economic impacts, even though the level significance is rather high, namely 11%.

5. Conclusion

In this paper the economic impact of the labor force training program in the informal sector of Côte d'Ivoire has been analyzed. The data collected are a subsample of the participants in three selected sectors, namely the agricultural sector, tailoring sector, and the electronics sector, and a comparable comparison group of nonparticipants. By the use of standard econometric tools developed for this kind of data, namely "difference-in-difference" estimators, the data have been analyzed in order to detect potential program impacts. The conclusions drawn are that positive economic impacts are found for some groups as a result of training received, namely women, the agricultural and electronics sectors, and for firms employing 1-3 individuals and firms with 10 or more employees.

There are six lessons from PAFPA during 1994-2002. First, an effective outreach program is key to reaching potential beneficiaries in the informal sector. Second, special attention should be given to the choice of training sponsors. To that end, institutional sponsors and enterprises should be given priority. Third, craftsmen do not respond very well to demands for training. It is, thus, necessary to work with their associations to sensitize craftsmen on the role they can play as trainers for the less-skilled labor force and to provide additional incentives. Fourth, allocation of public funds on a competitive basis (i.e., with public vocational training institutes competing with private institutions) can reduce costs and increase responsiveness of public spending on skills development. Fifth, lack of complementary inputs (water, credit, equipment, markets) tends to limit the impact on beneficiaries. This suggests a need for linking subprojects better with other projects and interventions. Sixth, existence of accountability mechanisms for a fund would enhance its efficiency (World Bank archives).

References

Angrist, J. D. & A. B. Krueger (1998), ”Empirical Strategies in Labour Economics”, Working Paper No. 401, Princeton University.

Baker, J. (2000), “Evaluating the Impact of Development Projects on Poverty: A Handbook for Practitioners”. Directions in Development, World Bank, Washington, D.C.

Card, D. (1990), “The Impact of the Mariel Boatlift on the Miami Labor Market”, Industrial and Labor Relations Review”, 43, 245-257.

Greene, W. H. (1997), “Econometric Analysis”, Prentice Hall, New Jersey.

Heckman, J. J. & J. A. Smith (1995), “Assessing the Case for Social Experiments”, Journal of Economic Perspectives, 9, 85-110.

Heckman, J. J., R. J. Lalonde & J. A. Smith (1995), “The Economics and Econometrics of Active Labor Market Programs”, Manuscript prepared for Handbook of Labor Economics III.

Heckman, J. J., H. Ichimura, J. Smith & P. Todd (1998), “ Caracterizing Selection Bias Using Experimental Data”, NBER Working Paper, No. 6699.